Welcome to SCH3U

Introductions: Teacher: Mrs. Neman
OFFICE: Math (3rd floor, #20080)/
Science (2nd floor, #20095)
416-395-3290

Course Prerequisite: SNC2D

Student Information Survey:

- Tell me about yourself

Text: McGrawHill Ryerson, Chemistry 11

Course Logistics

- *What is the course about? What topics will be covered?*

Strands of Study (Units)	Number of Lessons
Matter, Chemical Trends and Chemical Bonding	15
Chemical Reactions	15
Quantities in Chemical Reactions	17
Solutions and Solubility	20
Gases and Atmospheric Chemistry	14

Missed Evaluations

- **How will missed or incomplete evaluations impact my grade?**
- **Zero: Earned vs. placeholder**
- Absences for an evaluation will result in a mark of **ZERO** unless arrangements have been made with your teacher **prior** to the evaluation.
- **Do NOT expect to show up the next day with a note of any kind and be able to write the test/quiz.**
- Projects/assignments are due on the given due dates. If there are difficulties, discuss these issues with your teacher as soon as possible. This must be BEFORE the due date if any accommodations are to be made. Otherwise a mark of zero will be earned.
- Leaving early for a family vacation will not be considered a legitimate excuse for missing evaluations.

Keys to Your Success

•Your achievement in Learning Skills (independent work, teamwork, organizational skills, initiative and work habits) is key to your success.

•Academic integrity, good attendance, homework, PARTICIPATION and homework and assignment completion are critical.

•Repect yourself and other's.

•SAFETY in the Lab!

STUDENTS WHO ARE SUCCESSFUL IN SCIENCE REGULARLY:

- **USE CLASS TIME EFFECTIVELY**
- **Use a homework study buddy**
- **ASK QUESTIONS IN CLASS**
- **USE THE TEXTBOOK**
- **REVIEW EVERY DAY**
- **COME IN FOR EXTRA HELP**

Assessment & EVALUATION

quizzes, tests, problem-sets, laboratory activities, hands-on activities, independent study, problem-based learning, role-plays, and simulations.

Term Evaluation				
70 %	**Knowledge/ Understanding 21%**	**Inquiry 21%**	**Communication 14%**	**Making Connections 14%**
Final Evaluation				
30 %	**Exam**			

Ice Breaker

- **Chemistry Magic Box:**
  Put the number of the definition from the list below into the space. Check your answers by adding the numbers to see if all the sums of all rows, both across and down add up to the same number, the Magic Number
- If you finish, try the chemistry story (on the back of the sheet)

What is Chemistry

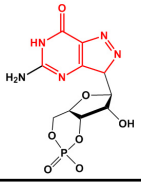
- **Chemistry:** the study of matter and energy and the interactions between them.

Why Study Chemistry?

- The chemical industry is one of the most important industries in the world.
- **The chemical industry is important for many reasons:**
- In Ontario, the chemical industry has employed over **50 000** people (creates jobs) and produced products worth over $22 billion.
- The chemical industry is responsible for the production of **plastic** which we use every where in our everyday life (bottles, parts of cars, parts of TVs, pencils, walls, clothing have plastic fibres, cell phones).

Chemistry is responsible for solving several societal issues

- **Environmental issues**: Preventing release of dangerous toxins from manufacturing sites, preventing corrosion (rust) on buildings and important monuments.
- **Health Issues:** Developing drugs to fight dangerous diseases, developing lifestyle drugs (ex: Viagra).
- Many diseases occur because of altered chemistry in your body. If we understand this chemistry we are in a better position to fix it should anything go wrong with it.



Chemistry and Aspartame

- Aspartame was discovered in 1965 by James M. Schlatter. Schlatter had synthesized aspartame in the course of producing an antiulcer drug candidate. He accidentally discovered its sweet taste when he **licked his finger**, which had become contaminated with aspartame, to lift up a piece of paper.

Chemistry is Everywhere

- When you cook, you are performing chemistry.
- Chemistry is occurring in you as we speak.
- When you recharge a battery, you are using chemistry.
- When you light a candle, you are using chemistry.
- When you freeze water, you are using chemistry…The list goes on and on…and on…and on…

ABC'S of Chemistry

- Everyone comes up and puts 2-3 related chemistry concepts
- It must be related to chemistry (i.e. element and properties, chemical reactions, etc..)
- If something is already on the board, you must put something else on!

Tomorrow….

Please bring:

1) Calculator (scientific)
2) Signed Safety Contract

We will begin:

Unit 1: Matter and Chemical Bonding

- Review of grade 10 Science
- Measurement and Estimation Lab

Unit 1: Matter, Chemical Trends, and Chemical Bonding

- 1) Review: Matter, Elements, Atomic Structure (Bohr-Rutherford Diagrams), Periodic table of elements
- 2) Compounds and Bonding (ionic and covalent): naming, structural representation, chemical formula.
- 3) Balancing Equations.

The Basics of Chemistry

- **What is matter?**
- **Matter:** is anything that occupies space and has a mass (energy is not matter).
- Examples of matter: desk, table, you, me, pencil, water.

Does Homer occupy space? Does homer have a mass?

Does this little pea occupy space? Does it have a mass?

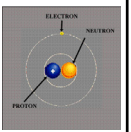
Does water vapour (gas) occupy space? Does it have a mass?

All matter is made of tiny particles called atoms:

- **Atom:** Smallest part of an element that has all the element's properties.
- E.g. Gold (Au) and Silver (Ag) are elements.
- **Elements:** Substance that cannot be broken down into any simpler substance.

Structure of the Atom

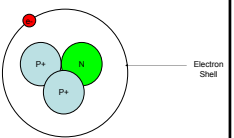
- Atoms are **not** the smallest particles of matter.
- Atoms are composed of even smaller particles called **subatomic particles (the protons, electrons, and neutrons)**.
- **Electrons:** have a charge of -1. Orbit around the center of the atom in energy levels called shells.
- **Protons:** have a charge of +1. Are located at the center of the atom with the neutrons.
- **Neutrons:** do not have a charge (charge of 0). Are located at the center of the atom with the Protons.



Subatomic Particles

Particle	Symbol	Charge	Relative Mass (u)
Electron	e^-	-1	~0
Proton	p^+	+1	1
Neutron	n	0	1

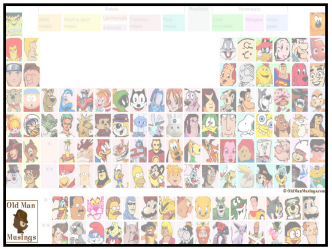
Electrons are in orbit around the nucleus just like planets are in orbit around the sun

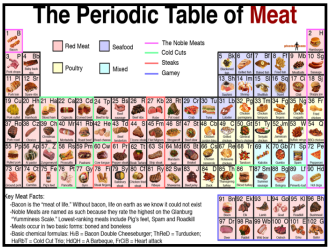


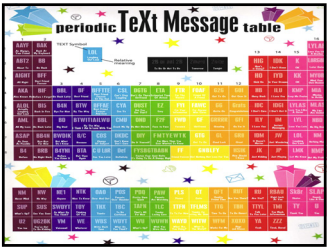
Note: The center of the atom is composed of protons and neutrons. The center is called the **nucleus**.

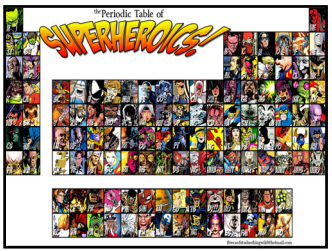
So, how can we tell how many protons, electrons, and neutrons an element has?

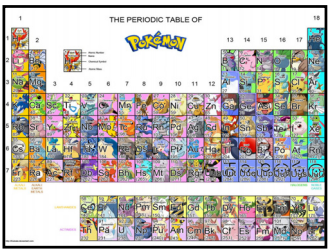
•THE PERIODIC TABLE OF ELEMENTS!

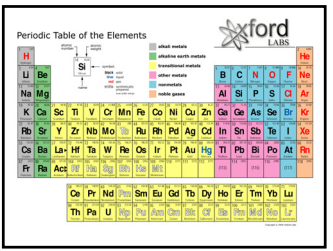

Old Man Musings


The Periodic Table of Meat
Red Meat
Seafood
Poultry
Mixed
The Noble Meats
Cold Cuts
Steaks
Game
Key Meat Facts:
-Bacon is the "meat of life." Without bacon, life on earth as we know it could not exist
-Noble Meats are named as such because they rate the highest on the Glanburg "Yumminess Scale." Lowest-ranking meats include Pig's feet, Spam and Roadkill
-Meats occur in two basic forms: boned and boneless
-Basic chemical formulas: HoB = Bacon Double Cheeseburger; ThReO = Turducken; HaRdT = Cold Cut Trio; HiEtH = A Barbeque, FrOtt = Heart attack

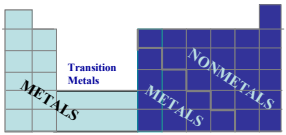

periodic TeXt Message table


The Periodic Table of
SUPERHEROICS


THE PERIODIC TABLE OF
Pokémon


Periodic Table of the Elements
Ford
LABS

Metals and Nonmetals



Metals- General properties

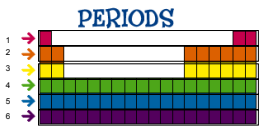
- Located on the left hand side
- Usually solids
- Lustrous, ductile, malleable
- Good conductors of heat and electricity

Non-metals: General properties

- Located on the right hand side
- Can be solid, liquid or gaseous
- Dull and brittle solids
- Poor conductors, good insulators

The Periodic Table of Elements: created by Dmitri Mendeleev

- All of the known elements are organized in the periodic table of elements.
- The horizontal rows are called **periods** (7 periods.

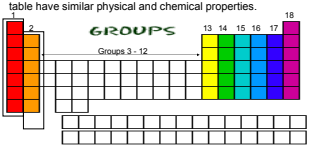


The period in which an element belongs tell us how many electron shells that element has!

- Period 1: 1 shell
- Period 2: 2 shells
- Period 3: 3 shells
- Period 4: 4 shells
- Period 5: 5 shells
- Period 6: 6 shells
- Period 7: 7 shells

The Periodic Table of Elements: created by Dmitri Mendeleev

- The vertical columns are called **families** or **groups**. There are 18 groups. Elements in the same family (group) of the periodic table have similar physical and chemical properties.



The Group in which the element belongs tells us the number of valence electrons and the ion that the element will form.

- Group 1 elements: 1 valence electron.
- Group 2 elements: 2 valence electrons.
- Group 3-12 are weird
- Group 13: 3 valence electrons
- Group 14: 4 valence electrons
- Group 15: 5 valence electrons
- Group 16: 6 valence electrons
- Group 17: 7 valence electrons
- Group 18: Complete valence shell (2 for He and 8 for the rest)

Regions of the Periodic Table

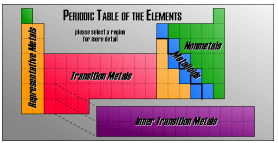
Main group or representative elements
- Found in the tallest groups of the periodic table
- Most reactive (except the noble gases) and most predictable in periodic properties

Transition elements
- Found in the middle region of the periodic table in a rectangle
- Composed of metals with less predictable properties with respect to the periodic properties.

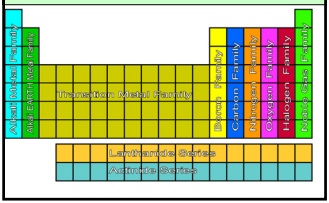
Inner transition elements
- Found in the bottom two rows of the periodic table in the lanthanide and actinide series (i.e. atomic numbers from 58 to 72 and from 89 to 104).
- Top row of inner transition elements is also called the lanthanide series, because these elements follow lanthanum, atomic number 57.
- The bottom row of inner transition elements is also called the actinide series, because these elements follow actinium, atomic number 89.

The Categories

- The elements are organized in three categories: the metals (left and centre of the periodic table), the non-metals (on the right side of the periodic table), and the metalloids (the staircase of elements).

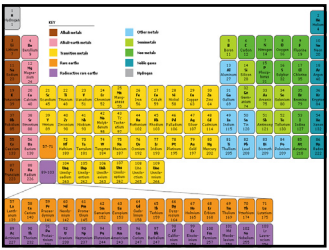


Periodic Families



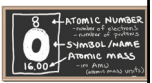
The families: Further division of the categories

- **Four common Chemical Families:**
- 1) **Alkali metals** (group 1): Very reactive metals that react easily with water and oxygen in the air. Hydrogen is not an alkali metal!
- 2) **Alkaline earth metals** (group 2): Less reactive than group 1 metals.
- 3) **Halogens** (group 17): very reactive non-metals.
- 4) **Noble gases** (group 18): non-metals that are very Unreactive.



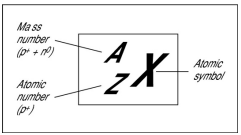
Elements on the Periodic Table

- The **atomic number (Z)** is located on the top left of the square. This number indicates the number of protons in an atom. Since atoms contain the same number of protons and electrons, the atomic number also indicates the number of electrons.
- **Atomic Mass (A):** The number at the bottom of the square indicates the average mass of the atom.
- **Each** element on the periodic table is represented by a square. The square contains a bunch of information about the element.



Atomic Notation

- A short hand way to represent information of elements from the periodic table.



Elements

- **Are pure substances that cannot be separated into different substances by ordinary processes**
- **Are the building blocks of matter**
- **All atoms of an element have the same number of protons**
- **118 elements known today**

Examples: carbon, nitrogen, gold

Liquid nitrogen.

Name the element found in each!

1. Carbon

2. Sodium 2

3. Aluminum

4. Copper

5. Sulfur

6. Iodine

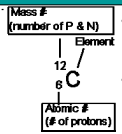
Symbols of Elements

- **Use 1 or 2 letter abbreviations**
- **Capitalize the first letter only**

Examples:

C	**carbon**	**Co**	**cobalt**
P	**phosphorus**	**Ca**	**calcium**
Ba	**barium**	**Mg**	**magnesium**

Atomic Notation



- Mass # = # Protons + # Neutrons.
- Atomic # = # of protons (also the # of electrons in a neutral atom).

Atomic Notation

$^{4}_{2}He$

$^{7}_{3}Li$

- Lithium has 3 electrons.
- Lithium has 3 protons.
- Lithium has 4 neutrons.

More Atomic Symbols

16 O 8	31 P 15	65 Zn 30
8 p^+	15 p^+	30 p^+
8 n	16 n	35 n
8 e^-	15 e^-	30 e^-

It is the number of subatomic particles that determine what element you have: the atoms of every element have the same number of protons

- Hydrogen atoms always have one proton.
- Lithium atoms always have 3 protons.
- Sample problem: An element has 2 protons. The element is Helium?
- Hint: Listen to me talk…

Calculate # of e, n, p for Ca, Ar, and Br.

RECALL:

protons = # of electrons = atomic number

of neutrons = mass number – atomic number

	Atomic Number(Z)	Mass Number(A)	p+	n°	e-
Ca	20	40	20	20	20
Ar	18	40	18	22	18
Br	35	80	35	45	35

Case Study: Sulfur – A typical atom

- **A Bohr diagram:** an illustration of an atom that shows the arrangement and number of electrons in each shell.
- All sulfur atoms have 16 protons.
- All sulfur atoms have 16 electrons (to match the number of protons).

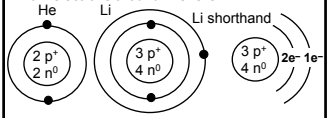
Sulfur

Location of Electrons:

- The electrons are located around the nucleus in shells.
- The first shell (the innermost shell) can hold up to **2 electrons.**
- The next two shells can hold up to **eight electrons** each.
- **Valence shell:** The outer most shell of an atom. The electrons in this shell are called the
- **valence electrons**. The valence electrons determine the chemical and physical properties of elements.

Bohr - Rutherford diagrams

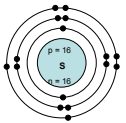
- Putting all this together, we get B-R diagrams
- To draw them you must know the # of protons, neutrons, and electrons (2,8,8,2 filling order)
- Draw protons (p^+), (n^0) in circle (i.e. "nucleus")
- Draw electrons around in shells



Draw Be, B, Al and shorthand diagrams for O, Na

Steps to Drawing a Bohr-Rutherford Diagram – Sulfur 16 electrons, 16 protons, and 16 neutrons

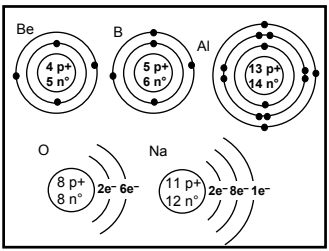
- 1) Draw a small center circle to represent the nucleus.
- 2) Write the number of protons and neutrons within this circle.
- 3) Draw slightly larger circle around this center circle to represent the inner shell.
- 4) Add electrons (2 max) to this shell (represent the electrons as dots).
- 5) Draw slightly larger circle around this circle to represent the next shell.
- 6) Add electrons (8 max) to this shell (represent the electrons as dots).
- 7) If this shell gets filled, draw another shell and add up to 8 electrons to it.



Note: Adding electrons should be done in an organized fashion.

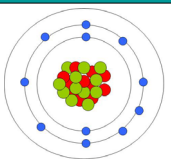
Electron Levels (Shells)

- **Contain electrons that are similar in energy and distance from nucleus**
- **Low energy electrons are closest to the nucleus**
- **Higher energy electrons are farther away from the nucleus**
- **The first shell (1) is lowest in energy, 2nd level next and so on** 1<2<3<4
- **Many shells also have sublevels**



Can you spot the mistake in this Bohr-Rutherford Diagram of Sodium?

- **There should be 3 shells, the first with 2 electrons, the second with 8 and the third with 1**



Bohr Diagrams of First 20 Elements from the Periodic Table

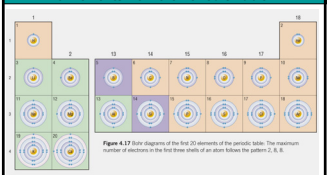


Figure 4.17 Bohr diagrams of the first 20 elements of the periodic table. The maximum number of electrons in the first three shells of an atom follows the pattern 2, 8, 8.

Periodic Law

All the elements in a group have the same electron configuration in their outermost shells

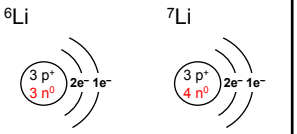
Example: Group 2

Be 2, 2
Mg 2, 8, 2
Ca 2, 2, 8, 2

Isotopes and Radioisotopes

- Atoms of the same element that have **different numbers of neutrons** are called isotopes.
- Due to isotopes, mass #s are not round #s.
- Li (6.9) is made up of both ^{6}Li and ^{7}Li.
- Often, at least one isotope is unstable.
- It breaks down, releasing radioactivity.
- These types of isotopes are called radioisotopes

Q- Sometimes an isotope is written without its atomic number - e.g. ^{35}S (or S-35).
Q- Draw B-R diagrams for the two Li isotopes.
A- The atomic # of an element doesn't change Although the number of neutrons can vary, atoms have definite numbers of protons.



Lewis Dot Structures of Elements

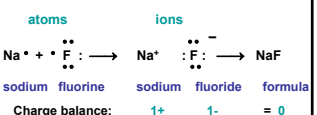
- *When compounds form or when we study the reactivity of elements, the only electrons that are involved are those in each atom's* ***outermost shell (valence shell).***
- **Lewis Structures** (or electron-dot diagrams): representation of the atom showing the outermost electrons (valence electrons) as dots

Lewis Dot structure for Chlorine:
•Notice that only the valence electrons are represented and the symbol is used to represent the inner electrons and the nucleus!

How to Draw Lewis Dot Structures

1. **Determine the number of valence electrons of the element.** *Recall: The number of valence electrons (outermost electrons) of an element is equal to its group number.*
2. **Draw the symbol of the element.** The symbol of the element is used to represent the core (protons and neutrons) and the inner electrons.
3. **The symbol is assumed to have four sides**, and the electrons in the outermost energy level are placed as dots on each of the sides.
4. **The electrons are placed singly on each side and are then paired on each side until the number of outer electrons has been attained.**

- In an ionic compound, the charges of the cations and anions must always cancel out.
- **Subscripts** are used if more than one atom is needed to cancel the charges:



Diatomic Elements

- Some elements are composed of two atoms bonded together
- Whenever you write the symbol for these elements a subscript must be written
  - **Hydrogen H_2**
  - **Oxygen O_2**
  - **Nitrogen N_2**
  - **Fluorine F_2**
  - **Chlorine Cl_2**
  - **Bromine Br_2**
  - **Iodine I_2**

Polyatomic Elements

- Some elements are composed of more than two atoms bonded together
- These elements must also be written with the proper subscript.
- **Phosphorus P_4**
- **Sulfur S_8**
- **Ozone O_3 (a rare form of oxygen)**

Naming Chemical Compounds

- The nomenclature rules proposed by the International Union of Pure and Applied Chemistry (IUPAC) are used as a universal standard method of naming chemicals.
- We will start with two types of compounds:
- An **IONIC COMPOUND** consists of a ***metal*** cation bonded to a ***nonmetal*** anion.
- A **MOLECULAR COMPOUND** consists of two nonmetal atoms sharing valence electrons.

Common Names

- A lot of chemicals have common names as well as the proper IUPAC name.
- Chemicals that should always be named by common name and never named by the IUPAC method are:
  - H_2O water, not dihydrogen monoxide
  - NH_3 ammonia, not nitrogen trihydride

Formulas of Ionic Compounds

- The metal cation in many compounds have only ONE possible charge.

Na^+	Zn^{2+}	Al^{3+}	Ca^{2+}
sodium	**zinc**	**aluminum**	**calcium**

*The charges are **memorized** or **predicted** using a periodic table!*

- The cations are bonded to nonmetal anions:

O^{2-}	N^{3-}	F^-	Br^-
oxide	**nitride**	**fluoride**	**bromide**

Notice that simple anions are always named with the suffix "ide"

Predicting Charges on Monatomic Ions

KNOW THESE !!!!

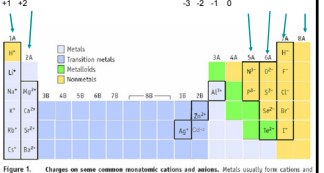


Figure 1. Charges on some common monatomic cations and anions. Metals usually form cations and nonmetals usually form anions.

Forming Binary Ionic Compounds

Write the formula for the ionic compound that will form between Ba^{2+} and Cl^{-}.

Solution:

1. **Balance charge with + and – ions**
2. **Write the positive ion of metal first, and the negative ion** Ba^{2+} Cl^{-} Cl^{-}
3. **Write the number of ions needed as subscripts** $BaCl_2$

Writing a Formula

sodium chloride:	Na^{+} and $Cl^{-} \rightarrow NaCl$
lithium oxide:	Li^{+} and $O^{2-} \rightarrow Li_2O$
aluminum bromide:	Al^{3+} and $Br^{-} \rightarrow AlBr_3$
zinc nitride:	Zn^{2+} and $N^{3-} \rightarrow Zn_3N_2$
potassium iodide:	K^{+} and $I^{-} \rightarrow KI$
silver phosphide:	Ag^{+} and $P^{3-} \rightarrow Ag_3P$

Formulas of Ionic Compounds

- Many transition metals have more than one possible valence. These elements require Roman numerals because they can have more than one possible charge: **anything except Group 1A, 2A, Ag, Zn, Cd, and Al**

Multivalent Elements

1+,2+	2+,3+	2+,4+	3+,5+
3+,6+			
Cu	Fe	Sn	P
Cr			
Hg	Ni	Pb	As
	Co	Mn	Sb

Rules for Naming Multivalent Compounds

- **(1) Write the name of the multivalent metal element; (2) write the valence as a Roman numeral; (3) write the name of the non-metal with an "*-ide*" suffix.**

$FeCl_2$	(Fe^{2+})	**iron (II) chloride**
Fe_2S_3	(Fe^{3+})	**iron (III) sulfide**
$CuCl$	(Cu^{+})	**copper (I) chloride**
SnF_4	(Sn^{4+})	**tin (IV) fluoride**
$PbCl_2$	(Pb^{2+})	**lead (II) chloride**

Polyatomic (Complex) Ions

- All of the cations and anions so far have been **simple ions** - single atoms that have lost or gained electrons.
- A **polyatomic ion** is a charged molecule.

examples:

nitrate: NO_3^{-} sulfate: SO_4^{2-} hydroxide: OH^{-}

- Most polyatomic ions are **anions**. Ammonium, NH_4^{+}, is the most common complex **cation**.

Polyatomic Compounds

- Salts can be a combination of a metal with a polyatomic ion.
- Simply treat each polyatomic ions as one unit and cancel charges to obtain the formula:

  magnesium sulfate Mg^{2+} SO_4^{2-} $MgSO_4$
- Add brackets if more than one polyatomic ion is needed:

  aluminum carbonate Al^{3+} CO_3^{2-} $Al_2(CO_3)_3$
- Add Roman numerals to the name if the metal is multivalent:

  iron (II) acetate Fe^{2+} $C_2H_3O_2^{-}$ $Fe(C_2H_3O_2)_2$

Polyatomic Compounds

$Ca(OH)_2$ - calcium hydroxide
$CuSO_4$ - copper(II) sulfate
NH_4NO_3 - ammonium nitrate
$Co_2(CO_3)_3$ - cobalt(III) carbonate

The Prefix System for Covalent Compounds

- Covalent compounds are made of two NONMETAL elements sharing valence electrons.
- **Prefixes** are used to indicate the number of each atom present in the formula.

1	mono
2	di
3	tri
4	tetra
5	penta
6	hexa
7	hepta
8	octa
9	nona
10	deca

Prefix System for Molecular Compounds

- Add prefixes to indicate the number of atoms.
- Omit 'mono-' prefix on the first element.
- Change the ending of the second element to '-ide'.

CO_2 is named "carbon dioxide"
CO is named "carbon monoxide"
N_2O is named "dinitrogen monoxide"
SO_3 is named "sulfur trioxide"
Challenge: SO_3^{2-} is named ____sulfite____.

Balancing Equations

- Law of Conservation of Matter:
  - In a chemical reaction, matter can be neither created nor destroyed.
  - In a chemical reaction, the amount of reactants equal the amount of products.

Balancing Equations

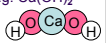
- Paraphrase:
- Law of Conservation of ***Atoms***:
  - The number of atoms of each type of element must be the same on each side of the equation.

- If the subscripts cannot be altered, how can the atoms be made equal?
- Adjust the number of molecules by changing the ***coefficients***.

How molecules are symbolized

Cl_2 2Cl $2Cl_2$

- Molecules may also have brackets to indicate numbers of atoms. E.g. $Ca(OH)_2$
- Notice that the OH is a group



- The 2 refers to both H and O
- How many of each atom are in the following?
  a) NaOH Na = 1, O = 1, H = 1
  b) $Ca(OH)_2$ Ca = 1, O = 2, H = 2
  c) $3Ca(OH)_2$ Ca = 3, O = 6, H = 6

Balancing equations: MgO

- Example: Magnesium + Oxygen (from lab)
- Mg + $O_2 \rightarrow$ MgO

- However, this is not balanced
- Left: Mg = 1, O = 2
- Right: Mg = 1, O = 1

Some Practice Reactions

1) Balance the reactions:

a) $Al_2(SO_4)_3 + 3K_2CrO_4 \rightarrow 3K_2SO_4 + Al_2(CrO_4)_3$

b) $2HCl + Na_2SO_3 \rightarrow 2NaCl + H_2O + SO_2$

Balance equations by "inspection"

From Mg + $O_2 \rightarrow$ MgO

$2Mg + O_2 \rightarrow 2MgO$ is correct

$Mg + \frac{1}{2}O_2 \rightarrow MgO$ is incorrect

$Mg_2 + O_2 \rightarrow 2MgO$ is incorrect

$4Mg + 2O_2 \rightarrow 4MgO$ is incorrect

Hints: start with elements that occur in one compound on each side. Treat polyatomic ions that repeat as if they were a single entity.

a) $P_4 + 5O_2 \rightarrow P_4O_{10}$

b) $2Li + 2H_2O \rightarrow H_2 + 2LiOH$

c) $2Bi(NO_3)_3 + 3K_2S \rightarrow Bi_2S_3 + 6KNO_3$

d) $C_2H_6 + 3.5O_2 \rightarrow 2CO_2 + 3H_2O$

$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

Other Balancing Hints

- Balance the metals first.
- Balance the ion groups next.
- Balance the other atoms.
- Save the non ion group oxygen and hydrogen until the end.

Homework:

- Complete Balancing Handout
- Naming Compounds Exercise Handout

Balance these skeleton equations:

a) $Mg + 2HCl \rightarrow MgCl_2 + H_2$

b) $3Ca + N_2 \rightarrow Ca_3N_2$

c) $NH_4NO_3 \rightarrow N_2O + 2H_2O$

d) $2BiCl_3 + 3H_2S \rightarrow Bi_2S_3 + 6HCl$

e) $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$

f) $6O_2 + C_6H_{12}O_6 \rightarrow 6CO_2 + 6H_2O$

g) $3NO_2 + H_2O \rightarrow 2HNO_3 + NO$

h) $Cr_2(SO_4)_3 + 6NaOH \rightarrow 2Cr(OH)_3 + 3Na_2SO_4$

i) $Al_4C_3 + 12H_2O \rightarrow 3CH_4 + 4Al(OH)_3$